

TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TD62001P, TD62001AP, TD62001F, TD62001AF, TD62002P, TD62002AP, TD62002F, TD62002AF, TD62003P, TD62003AP, TD62003F, TD62003AF, TD62004P, TD62004AP, TD62004F, TD62004AF

7CH DARLINGTON SINK DRIVER

The TD62001P/AP/F/AF Series are high-voltage, high-current darlington drivers comprised of seven NPN darlington pairs.

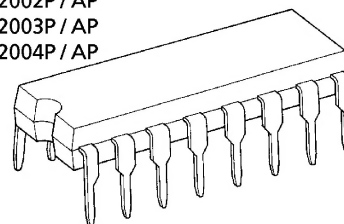
All units feature integral clamp diodes for switching inductive loads.

Applications include relay, hammer, lamp and display (LED) drivers.

FEATURES

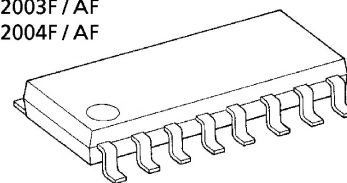
- Output current (single output) 500mA MAX.
- High sustaining voltage output
35V MIN. (TD62001P/F Series)
50V MIN. (TD62001AP/AF Series)
- Output clamp diodes
- Inputs compatible with various types of logic
- Package Type-P, AP : DIP-16pin
- Package Type-F, AF : SOP-16pin

TD62001P / AP
TD62002P / AP
TD62003P / AP
TD62004P / AP



DIP16-P-300-2.54A

TD62001F / AF
TD62002F / AF
TD62003F / AF
TD62004F / AF



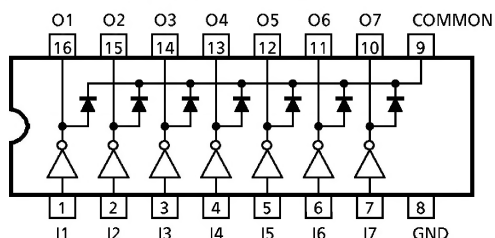
SOP16-P-225-1.27

Weight

DIP16-P-300-2.54A : 1.11g (Typ.)
SOP16-P-225-1.27 : 0.16g (Typ.)

TYPE	INPUT BASE RESISTOR	DESIGNATION
TD62001P / AP / F / AF	External	General Purpose
TD62002P / AP / F / AF	10.5-k Ω + 7V Zener diode	14~25V PMOS
TD62003P / AP / F / AF	2.7k Ω	TTL, 5V CMOS
TD62004P / AP / F / AF	10.5k Ω	6~15V PMOS, CMOS

PIN CONNECTION (TOP VIEW)

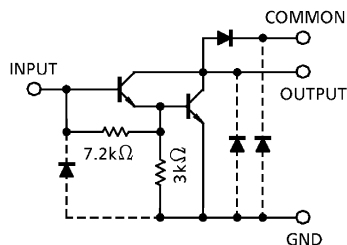


961001EBA2

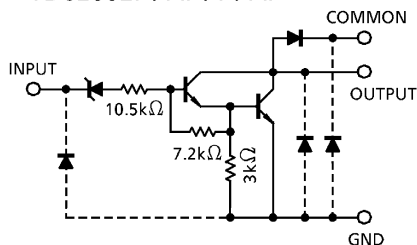
- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

SCHEMATICS (EACH DRIVER)

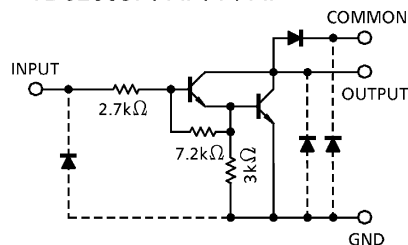
TD62001P / AP / F / AF



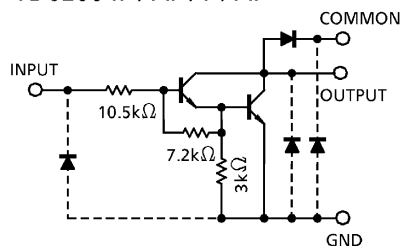
TD62002P / AP / F / AF



TD62003P / AP / F / AF



TD62004P / AP / F / AF



(Note) The input and output parasitic diodes cannot be used as clamp diodes.

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Output Sustaining Voltage	P, F	$V_{CE(SUS)}$	- 0.5~35	V
	AP, AF		- 0.5~50	
Output Current		I_{OUT}	500	mA / ch
Input Voltage		V_{IN} (Note 1)	- 0.5~30	V
Input Current		I_{IN} (Note 2)	25	mA
Clamp Diode Reverse Voltage	P, F	V_R	35	V
	AP, AF		50	
Clamp Diode Forward Current		I_F	500	mA
Power Dissipation	P	P_D	1.0	W
	AP		1.47	
	F, AF		0.54 / 0.625 (Note 3)	
Operating Temperature	P	T_{opr}	- 30~75	°C
	AP, F, AF		- 40~85	
Storage Temperature		T_{stg}	- 55~150	°C

(Note 1) Except TD62001P / AP / F / AF

(Note 2) Only TD62001P / AP / F / AF

(Note 3) On glass epoxy PCB (30×30×1.6mm Cu 50%)

RECOMMENDED OPERATING CONDITIONS ($T_a = -40\sim 85^\circ\text{C}$ and $T_a = -30\sim 75^\circ\text{C}$ for only Type-P)

CHARACTERISTIC		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Output Sustaining Voltage	P, F	$V_{CE(SUS)}$			0	—	35	V
	AP, AF				0	—	50	
Output Current	AP	I_{OUT}	$T_{pw} = 25\text{ms}$ 7 Circuits $T_a = 85^\circ\text{C}$ $T_j = 120^\circ\text{C}$	Duty = 10%	0	—	370	mA / ch
				Duty = 50%	0	—	130	
	P			Duty = 10%	0	—	295	
				Duty = 50%	0	—	95	
	F, AF			Duty = 10%	0	—	233	
				Duty = 50%	0	—	70	
Input Voltage	Except TD62001P / AP / F / AF	V_{IN}			0	—	24	V
Input Voltage (Output On)	TD62002	$V_{IN(ON)}$	$I_{OUT} = 400\text{mA}$ $h_{FE} = 800$		14.5	—	24	V
	TD62003				2.8	—	24	
	TD62004				6.2	—	24	
Input Voltage (Output Off)	TD62001	$V_{IN(OFF)}$			0	—	0.6	V
	TD62002				0	—	7.4	
	TD62003				0	—	0.7	
	TD62004				0	—	1.0	
Input Current	Only TD62001	I_{IN}			0	—	10	mA
Clamp Diode Reverse Voltage	P, F	V_R			—	—	35	V
	AP, AF				—	—	50	
Clamp Diode Forward Current		I_F			—	—	350	mA
Power Dissipation	P	P_D	$T_a = 85^\circ\text{C}$		—	—	0.6	W
	AP				—	—	0.76	
	AF, F		(Note) $T_a = 85^\circ\text{C}$		—	—	0.325	

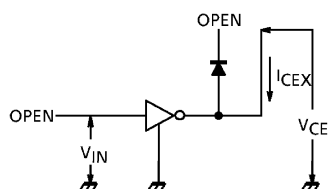
(Note) On glass epoxy PCB (30×30×1.6mm Cu 50%)

ELECTRICAL CHARACTERISTICS (Ta = 25°C unless otherwise noted)

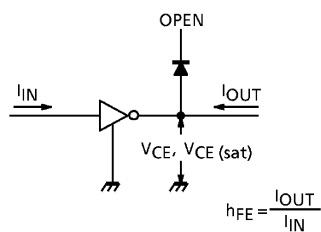
CHARACTERISTIC		SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT			
Output Leakage Current	AP, AF	I _{CEX}	1	V _{CE} = 50V, Ta = 25°C		—	—	50	μA			
	V _{CE} = 50V, Ta = 85°C			—	—	100						
	F			V _{CE} = 35V, Ta = 25°C		—	—	50				
				V _{CE} = 35V, Ta = 85°C		—	—	100				
	P			V _{CE} = 35V, Ta = 25°C		—	—	50				
				V _{CE} = 35V, Ta = 75°C		—	—	100				
Collector-Emitter Saturation Voltage		V _{CE (sat)}	2	I _{OUT} = 350mA, I _{IN} = 500μA		—	1.3	1.6	V			
				I _{OUT} = 200mA, I _{IN} = 350μA		—	1.1	1.3				
				I _{OUT} = 100mA, I _{IN} = 250μA		—	0.9	1.1				
DC Current Transfer Ratio		h _{FE}	2	V _{CE} = 2V, I _{OUT} = 350mA		1000	—	—				
Input Current (Output On)	TD62002	I _{IN (ON)}	3	V _{IN} = 20V, I _{OUT} = 350mA		—	1.1	1.7	mA			
	TD62003			V _{IN} = 2.4V, I _{OUT} = 350mA		—	0.4	0.7				
	TD62004			V _{IN} = 9.5V, I _{OUT} = 350mA		—	0.8	1.2				
Input Current (Output Off)	P	I _{IN (OFF)}	4	I _{OUT} = 500μA, Ta = 75°C		50	65	—	μA			
	AP, F, AF			I _{OUT} = 500μA, Ta = 85°C		50	65	—				
Input Voltage (Output On)	TD62002	V _{IN (ON)}	5	V _{CE} = 2V h _{FE} = 800	I _{OUT} = 350mA	—	—	13.7	V			
	I _{OUT} = 200mA				—	—	11.4					
	TD62003				I _{OUT} = 350mA					—	—	2.6
					I _{OUT} = 200mA					—	—	2.0
	TD62004				I _{OUT} = 350mA					—	—	4.7
					I _{OUT} = 200mA					—	—	4.4
Clamp Diode Reverse Current	AP, AF	I _R	6	V _R = 50V, Ta = 25°C		—	—	50	μA			
	V _R = 50V, Ta = 85°C			—	—	100						
	F			V _R = 35V, Ta = 25°C		—	—	50				
				V _R = 35V, Ta = 85°C		—	—	100				
	P			V _R = 35V, Ta = 25°C		—	—	50				
				V _R = 35V, Ta = 75°C		—	—	100				
Clamp Diode Forward Voltage		V _F	7	I _F = 350mA		—	—	2.0	V			
Input Capacitance		C _{IN}	—			—	15	—	pF			
Turn-On Delay	P, F	t _{ON}	8	V _{OUT} = 35V, R _L = 87.5Ω C _L = 15pF		—	0.1	—	μs			
	AP, AF			V _{OUT} = 50V, R _L = 125Ω C _L = 15pF		—	0.1	—				
Turn-Off Delay	P, F	t _{OFF}	8	V _{OUT} = 35V, R _L = 87.5Ω C _L = 15pF		—	0.2	—				
	AP, AF			V _{OUT} = 50V, R _L = 125Ω C _L = 15pF		—	0.2	—				

TEST CIRCUIT

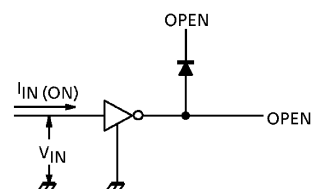
1. I_{CEX}



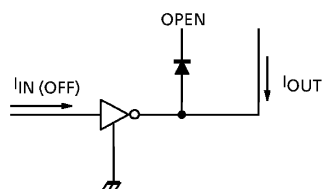
2. $V_{CE(sat)}$, h_{FE}



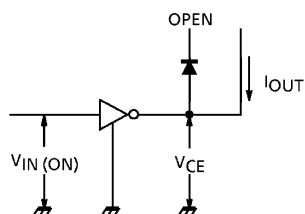
3. $I_{IN(ON)}$



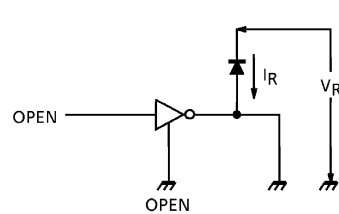
4. $I_{IN(OFF)}$



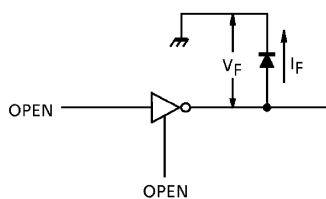
5. $V_{IN(ON)}$

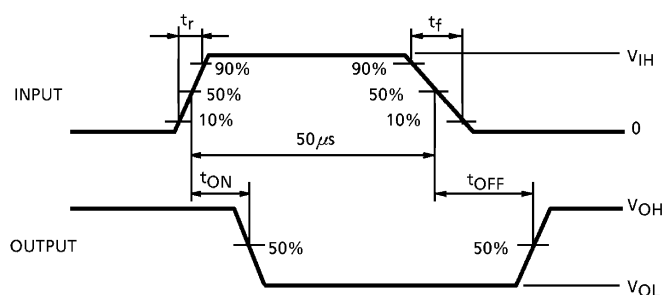
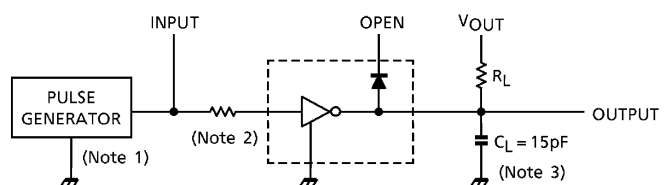


6. I_R



7. V_F



8. t_{ON} , t_{OFF}


(Note 1) Pulse width $50\mu s$, duty cycle 10%
Output impedance 50Ω , $t_r \leq 5ns$, $t_f \leq 10ns$

(Note 2) See below

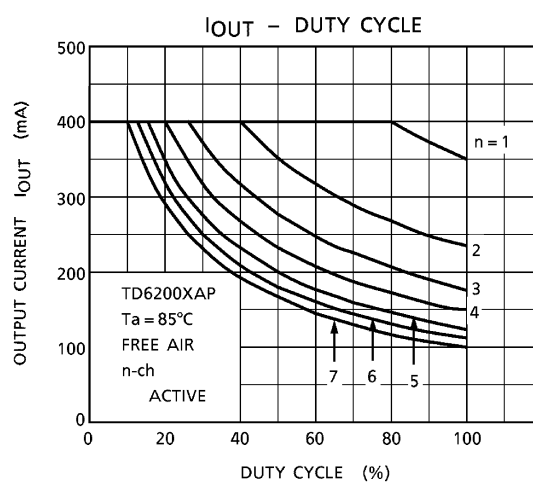
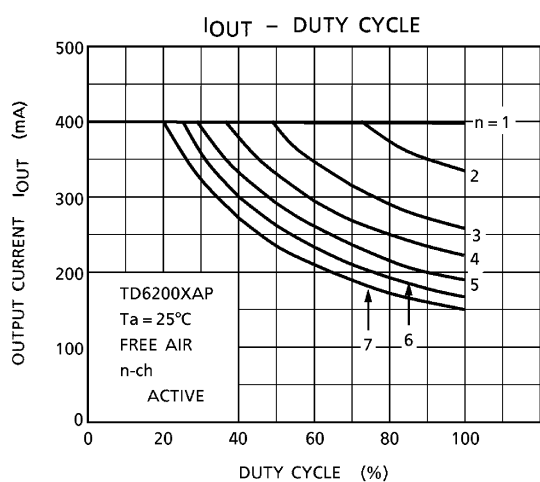
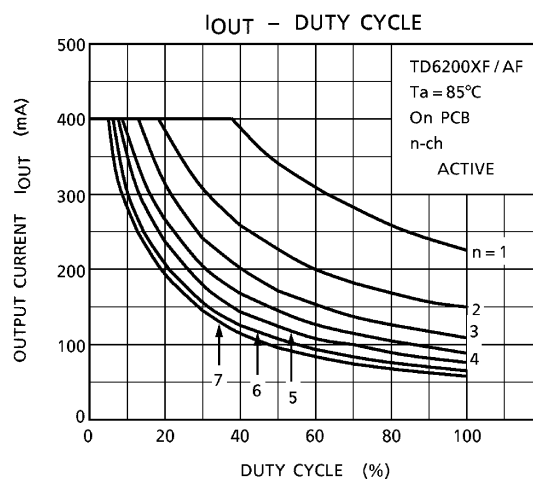
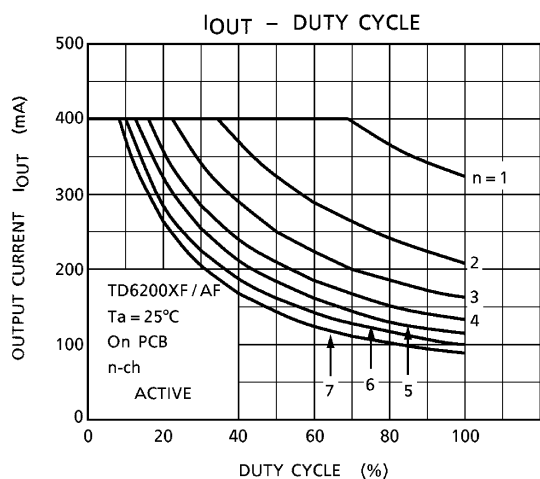
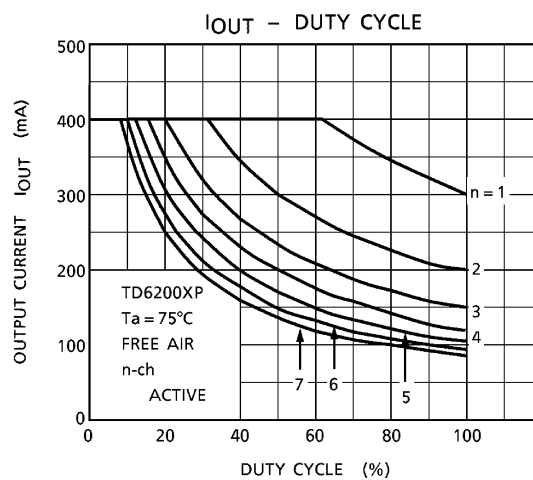
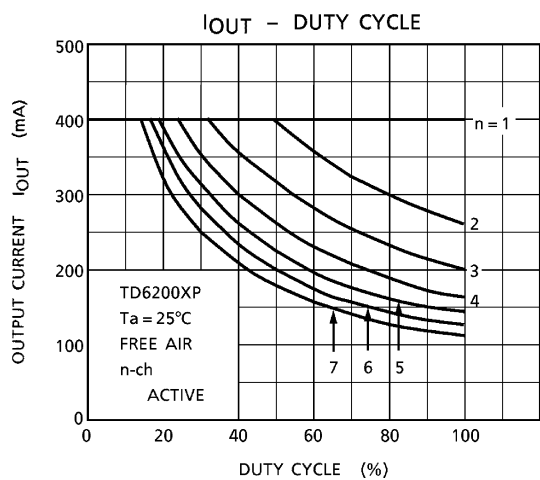
INPUT CONDITION

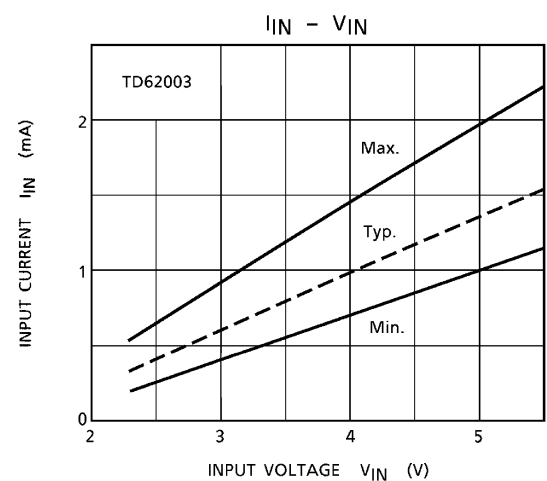
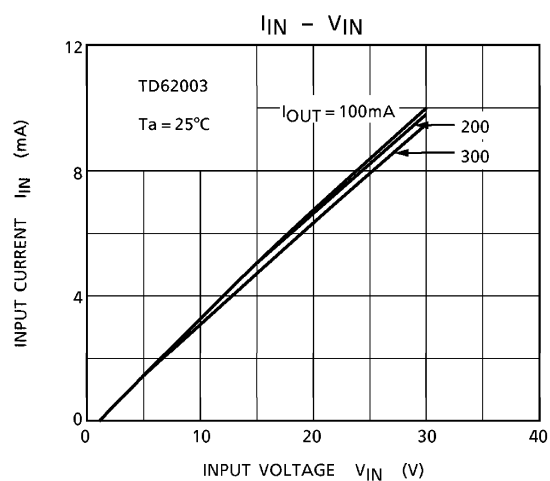
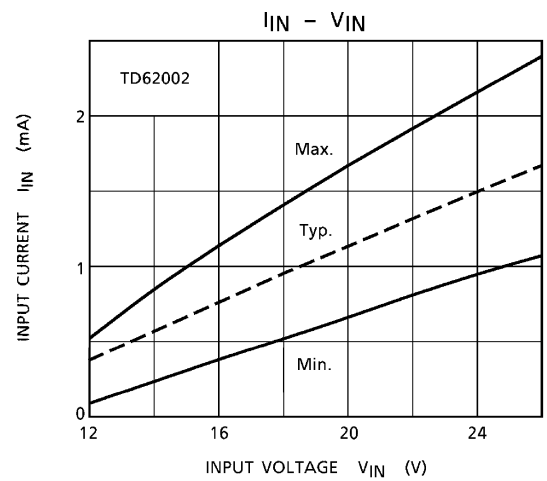
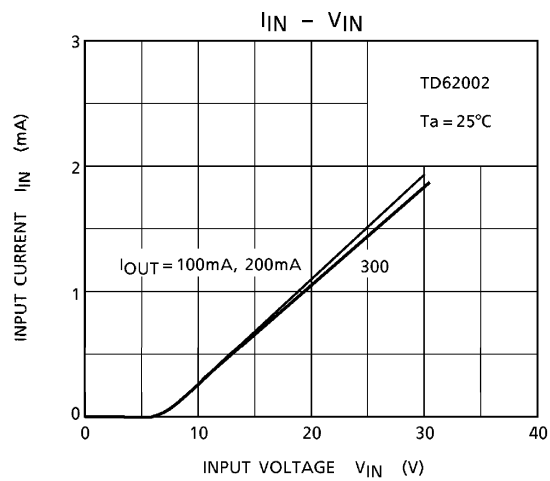
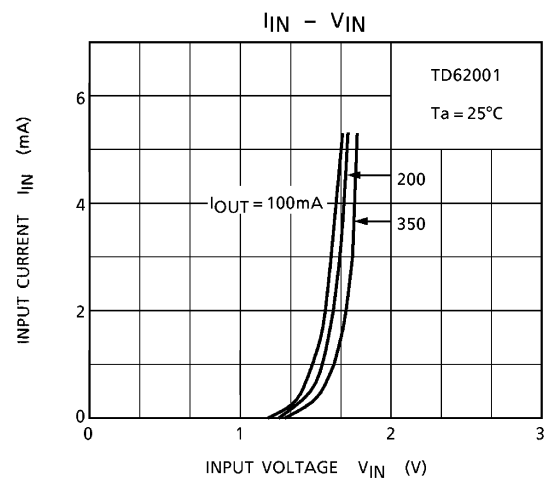
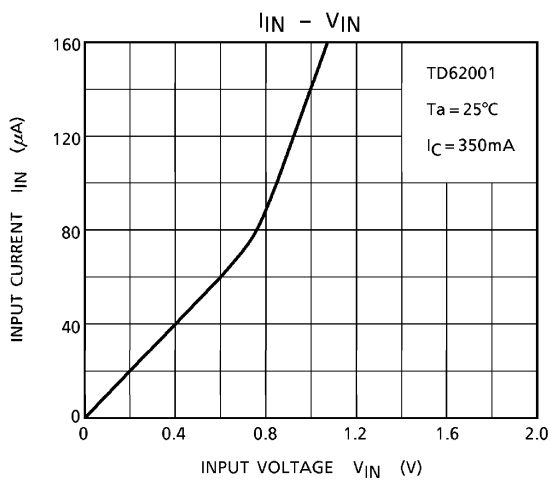
TYPE NUMBER	R1	V_{IH}
TD62001P / AP / F / AF	$2.7k\Omega$	3V
TD62002P / AP / F / AF	0	13V
TD62003P / AP / F / AF	0	3V
TD62004P / AP / F / AF	0	8V

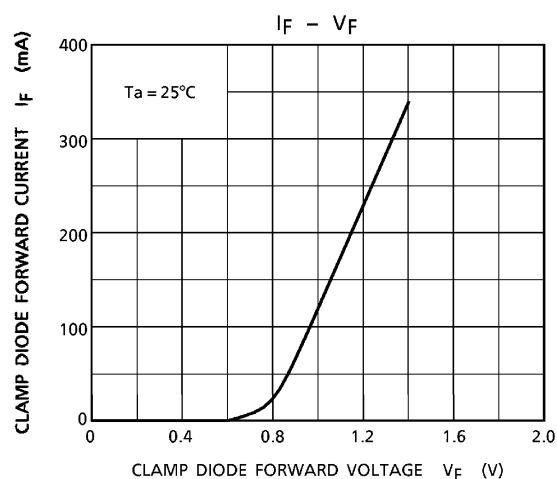
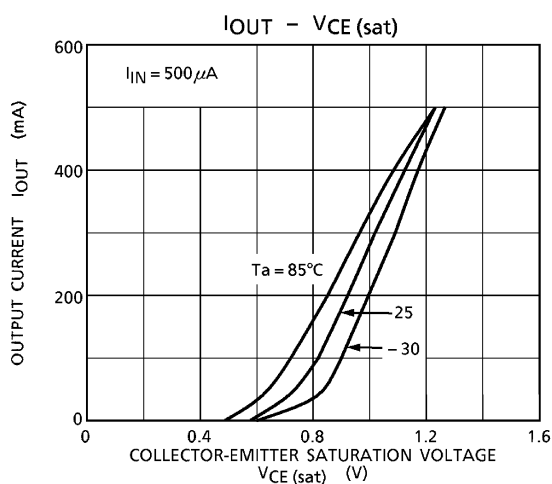
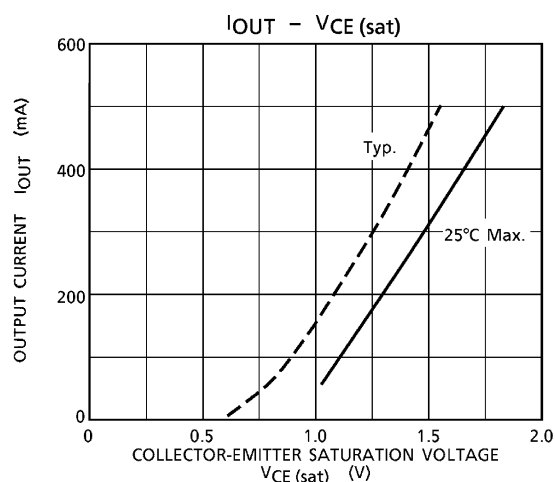
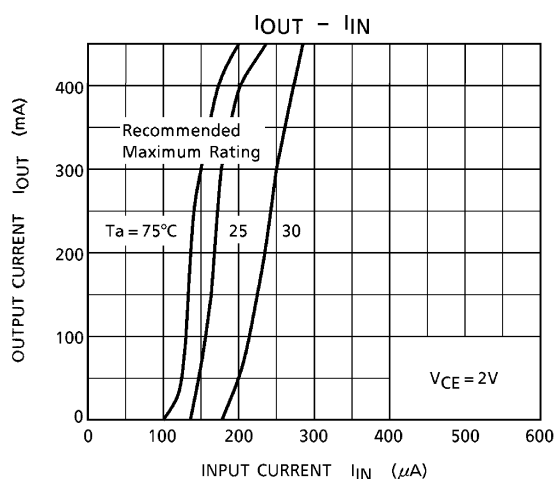
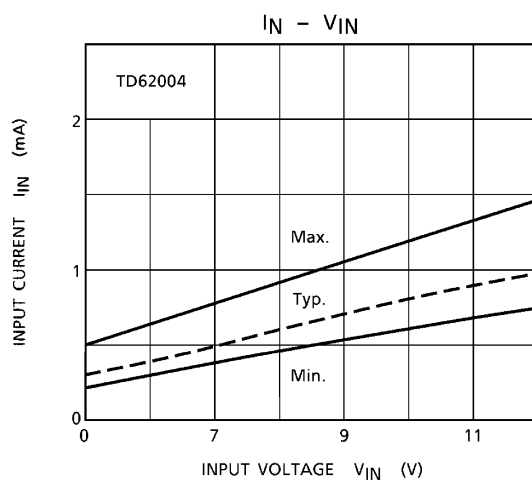
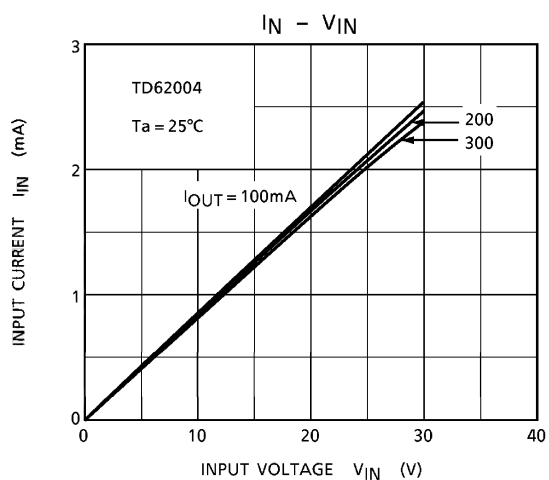
(Note 3) C_L includes probe and jig capacitance.

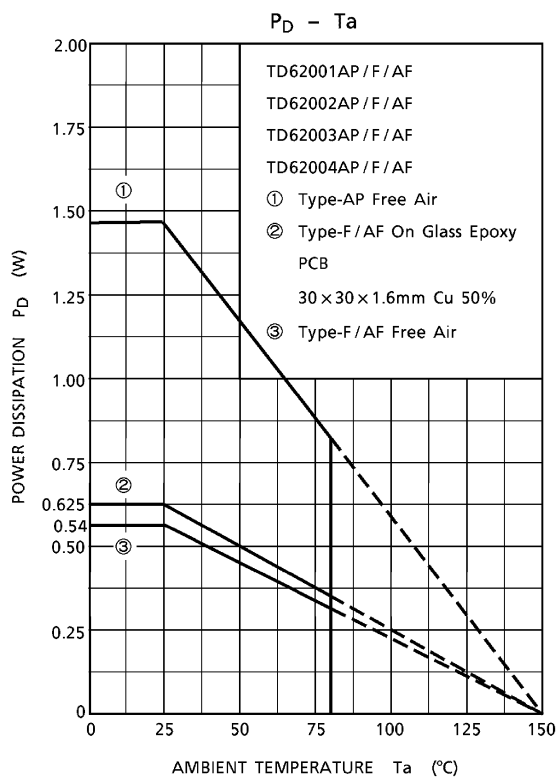
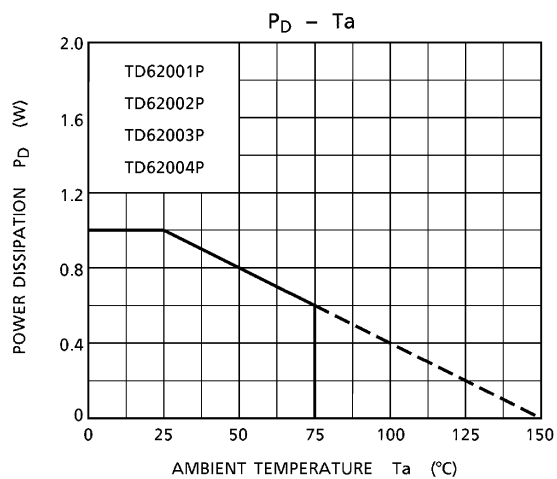
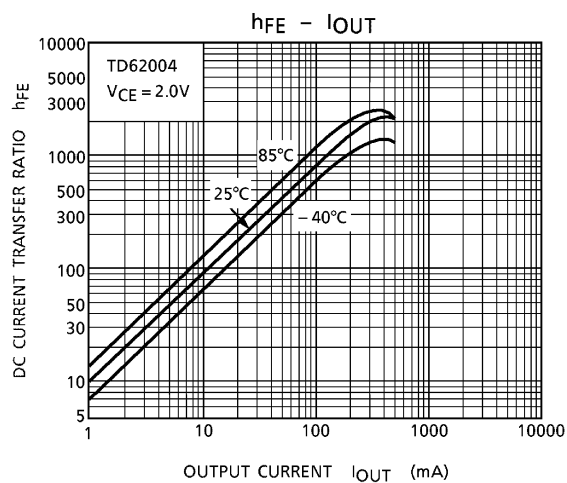
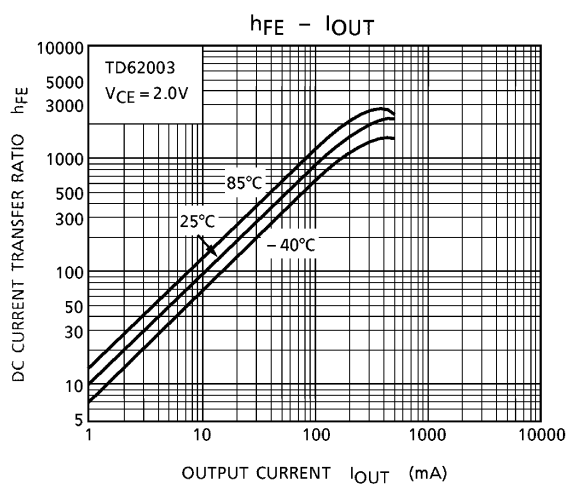
PRECAUTIONS for USING

Utmost care is necessary in the design of the output line, COMMON and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.





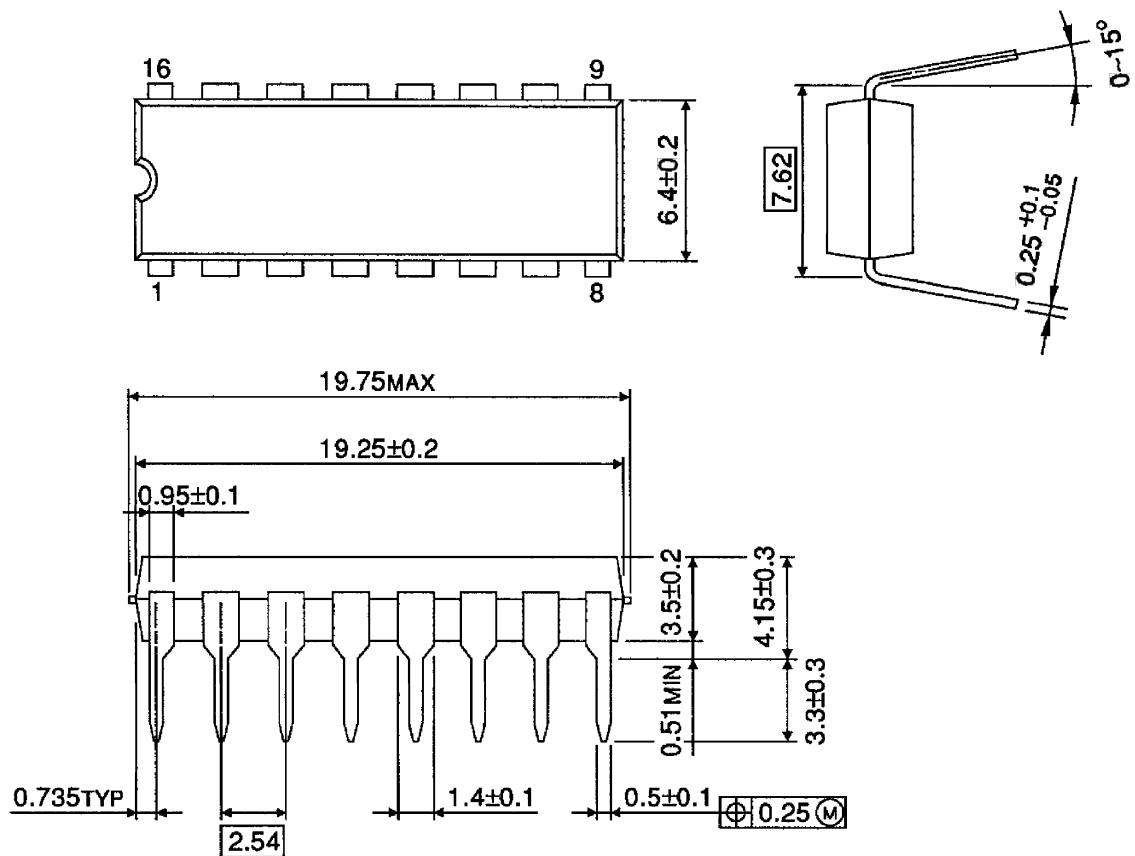




OUTLINE DRAWING

DIP16-P-300-2.54A

Unit : mm

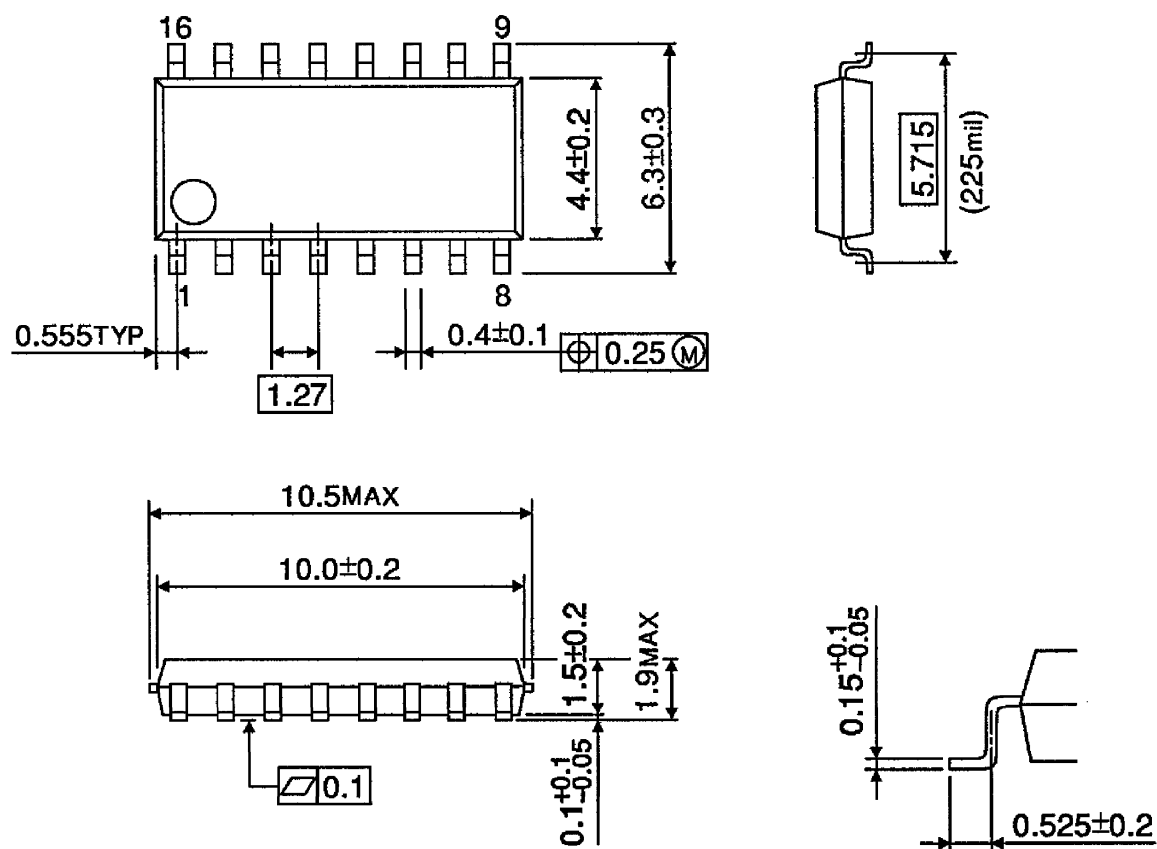


Weight : 1.11g (Typ.)

OUTLINE DRAWING

SOP16-P-225-1.27

Unit : mm



Weight : 0.16g (Typ.)